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The Exxon Valdez disaster of March 1989 revealed major shortcomings in this nation's ability to deal with such an incident, and resulted in the passage of the Oil Pollution Act of 1990 (OPA-90). In general, OPA-90 called for increased preparedness for major oil spills by requiring information of area committees, preparation of area plans, and periodic exercises. It was in response to this requirement for periodic exercises that the Coast Guard, Environmental Protection Agency, Research and Special Programs Office of Pipeline Safety, and Mineral Management Service developed the Preparedness for Response Exercise Program (PREP). The country is divided into 60 areas for oil spill response. PREP conducts 20 area exercises per year, so that each area is exercised once every three years. The 1995 San Diego PREP area exercise was the first exercise led by the Navy. This report serves as the formal evaluation report for the 1995 San Diego PREP area exercise and satisfies all Navy documentation requirements under PREP.

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San Diego 1995 Preparedness for Response Exercise Program (PREP) Exercise Evaluation Report

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Contents

Introduction and summary

Background

Section 311 of the Federal Water Pollution Control Act of 1972 (the Clean Water Act) required the formation of a National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and resulted in 40 CFR-300, which set out the National Response System for dealing with oil and hazardous substance emergencies.

The *Exxon Valdez* disaster of March 1989 revealed major shortcomings in this nation's ability to deal with such an incident, and resulted in the passage of the Oil Pollution Act of 1990 (OPA-90), which mandated revision of the NCP. In general, OPA-90 called for increased preparedness for major oil spills by requiring formation of area committees, preparation of area plans, and periodic exercises. It was in response to this requirement for periodic exercises that the Coast Guard (USCG), Environmental Protection Agency (EPA), Research and Special Programs Office of Pipeline Safety (Department of Transportation), and the Minerals Management Service developed the Preparedness for Response Exercise Program (PREP).

For the purpose of oil spill response, the country is divided into 60 areas, each of which has its own detailed response plan, known as an Area Contingency Plan (ACP). The PREP program conducts 20 area exercises per year, so that each area and its ACP is exercised once every 3 years. Leadership responsibility (organizing, hosting, and assuming a large share of the funding) for each exercise is assigned by the USCG; plans call for 14 industry-led and 6 government-led exercises per year. This San Diego exercise is considered industry led because, for the purpose of oil spills, the Navy is simply a member of the regulated community and is subject to regulation as is any other industrial operation. Government-led exercises are led by the USCG.

Each PREP exercise is put together by a design team composed of representatives of the major participating agencies. PREP guidelines [1] describe 15 "core components" of a response which should be exercised and evaluated. The design team decides which of the 15 could be worked into the exercise, with the local Coast Guard District Commander holding final say in matters of exercise design.

On 26 and 27 September 1995, Commander Naval Base San Diego (COMNAVBASE), and the Fleet Industrial Supply Center (FISC) San Diego, hosted the 1995 San Diego PREP area oil spill exercise. This was the first PREP exercise ever led by the Navy.

The basic aim of the exercise was to "enhance the ability of San Diego area committee members to organize and respond to a worst case oil spill" [2]. Specific goals included:

- Test the response plans of the San Diego Area Committee, COMNAVBASE San Diego, and the Fleet Industrial Supply Center, San Diego.
- Develop good working relationships between the various federal, state, and local agencies comprising the San Diego area committee.
- Provide training to those who would be called upon to respond in the event of an actual emergency.
- Establish standard methods for the evaluation of future Navy led PREP exercises.
- Fullfil Oil Pollution Control Act of 1990 (OPA-90) and State of California mandated exercise requirements. The specific requirements fulfilled by this exercise are:
  - — Triennial area exercise
  - — Equipment deployment drill
  - — Annual tabletop drill
  - — Quarterly notification drill.

Although the Navy led the exercise, it was not solely a Navy event. Participating organizations included elements of the U.S. Navy as the

responsible party; the U.S. Coast Guard local Marine Safety Office as the predesignated Federal On-Scene Coordinator; and various state, county, and local natural resource and emergency response organizations. Participating agencies are listed in appendix A.

The exercise focused on response management organization (command and control) and equipment deployment. The response management phase consisted of a 1-day (September 26) tabletop exercise in which players had to form and assemble an Incident Command System (ICS)/Unified Command System (UCS) and develop an Incident Action Plan (IAP). The equipment deployment phase, which was held on September 27, featured the actual deployment of equipment from the Navy Supervisor of Salvage (SUPSALV), the Coast Guard, San Diego based Navy oil spill response teams, and various southern California spill response cooperatives.

Although the Navy has participated in previous PREP exercises, this is the first time the Navy has led one. Because of the importance of this exercise in terms of both public visibility and in developing a standard procedure for evaluation of future Navy-led PREP exercises, COMNAVBASE asked the Center for Naval Analyses (CNA) to serve as evaluation director for the exercise. Our task was to observe, reconstruct, and prepare an exercise evaluation report as mandated by PREP guidelines.

This is that report. It serves as the formal evaluation report for the 1995 San Diego PREP area exercise, and satisfies all Navy documentation requirements under PREP.

Evaluation methodology

COMNAVBASE asked us to provide an objective reconstruction, analysis, and documentation of the exercise, similar to those we have performed for major fleet exercises. Thus, our method for evaluating this PREP exercise was basically the same as that which we regularly use to analyze fleet exercises. We placed members of our evaluation team throughout the response organization to observe events and take notes. At the end of the exercise, we collected copies of all logs maintained in the various cells, copies of all status boards and press

briefings, and participated in debriefs of all players. The goal of our reconstruction and analysis was to evaluate plans and organizational structure—not the performance of individual people. References [2, 3] describe our evaluation methodology in more detail.

Summary of results

The 1995 San Diego PREP area exercise was a success on two levels. First, the exercise provided valuable training to many Federal, State, and local government agencies, and to local industries and spill cooperatives. It also pointed out several strengths and weaknesses in the San Diego ACP [4], which will be addressed in future revisions of the plan. Second, the spill response itself went well. A multiagency response organization was formed and, within the limits of the exercise, was able to meet most of the goals stated in the plans.

Command and control

In analyzing the command and control phase, we found:

- Notifications went very well. Personnel from both the vessel and the FISC fuel terminal were knowledgeable about immediate notification requirements, and were able to quickly access phone notification lists and complete required notifications. Some of this good performance was probably an exercise artificiality: All players knew the exercise was to occur, so they had their notification instructions out and ready.
- The many agencies involved in the response were able to easily fit together into a unified structure. The ICS was put in place very early in the response, and all personnel understood the organizational structure and their individual responsibilities. This good performance was the result of the thorough training and practice conducted by all agencies in conjunction with PREP.
- Although each cell in the command structure functioned smoothly, communication between cells was a problem.

  - — Some cells held critical information concerning the size of the spill that was unknown to the Operations Cell early in the response.
  - — The Operations and Planning Cells had difficulty communicating their equipment needs to the Logistics Cell.
- Documentation and record keeping were limited. Many cells did not maintain watch logs or communication logs. Records of notifications were not kept in the command center or at the USCG Marine Safety Office (MSO).
- Although traditionally a problem area in PREP exercises, command spaces were generally adequate in this exercise.
  - — The space arrangement of the Operations and Planning Cells—sharing a large, divided room—facilitated open discussion and increased the flow of information.
  - — Problems can be encountered if cells are located in normally used work spaces. As the spill response grows in scope and time, some planning must be done to address the issue of moving cells into spaces that can accomodate long-term operations.

Equipment deployment

During the equipment deployment event, some of the assets and equipment that had been identified during the command and control phase the previous day were actually deployed on the water. Although deployment of only a small fraction of the assets identified as necessary to deal with the spill was called for in the exercise, it did show that the various agencies and cooperatives were able to operate recovery gear and deploy boom in potentially sensitive areas in San Diego Bay—areas that likely would be the highest priorities for protection in the event of a real spill.

Most of this response equipment was prestaged to San Diego in anticipation of the PREP exercise. Thus, this exercise did not test the ability to rapidly mobilize and bring assets on scene quickly—a critical component of an oil spill response.

Communications between the response command post and field assets were realistically tested and worked as planned (after a minor bug was corrected).

Organization of this report

This report is organized as follows:

- The first chapter following this introduction describes the exercise scenario and the response command organization. It also gives a brief narrative of the main events which occured during exercise play.
- The next two chapters present exercise results, lessons learned, and conclusions. There may be some repetition in these two chapters, but it was necessary to present our findings in two ways:
  - — The Results chapter is organized in terms of the various cells of the response organization. This presentation is geared to participants who want to know how their individual cells fared.
  - — The Lessons Learned/Conclusions chapter is organized in terms of the major functions comprising an oil spill response, as given in [1]. This is the format requested by the USCG; it facilitates input to USCG's PREP lessons-learned database.

Scenario and narrative of events

What type of spill is likely?

Before we discuss our exercise scenario, let's review the characteristics of a likely Navy spill.

The Navy On-Scene Commander (NOSC) plan [5] identifies the following facilities in the San Diego area as the locations at which large quantities of fuel are routinely handled and a major oil spill could potentially occur:

- Public Work facilities at NAS North Island, Naval Station San Diego, and Submarine Base San Diego
- Fueling facility at Naval Station San Diego
- Fuel Depot at Naval Supply Center San Diego.

The largest volumes of oil carried aboard Navy ships are large enough to produce a serious spill, but they are small compared to commercial tankers. Typical volumes for the Navy ships carrying the largest volumes are:

- Fleet oilers: 120,000 to 170,000 bbls
- Military Sealift Command (MSC) tankers: 186,000 bbls.

By comparison, the *Exxon Valdez* carried over 1 million bbls.

Almost all of the fuel handled by the Navy is either diesel fuel, Marine (DFM) or JP-5, both of which are much lighter and more volatile than heavy crude oil such as that spilled by the *Exxon Valdez*, and which we most often associate with oil spills. Because of these properties:

- Almost 50 percent of these fuels would evaporate in the first day after a spill and about 20 percent would evaporate each

succeeding day. This volatility also greatly increases the danger of fire or explosion.

- Because it is much lighter than crude, it is very difficult to recover.
- It is much more toxic to marine life than heavier oils.

Based on the above discussion, the Navy should prepare for a spill of light oils at one of the facilities listed above. It should place more emphasis on protecting sensitive areas and containing the spill rather than recovering the oil, and it must be prepared for the event of fire. There will probably be no need to scrape thick coatings of oil from beaches and marine birds and mammals after a Navy spill. These considerations led to the scenario used in the exercise.

Scenario

The exercise scenario assumed that a Military Sealift Command (MSC) vessel was docked at the FISC fuel pier on Point Loma, about 2 miles inside the mouth of San Diego Bay (figure 1). At 0500 (predawn), a foreign cargo vessel outbound from San Diego Bay lost power and drifted into the MSC vessel. The MSC vessel sustained a crack, and 300,000 gallons of DFM was released into the Bay. FISC personnel were responsible for initiating an immediate response, and all agencies were responsible for making the necessary notifications. COMNAVBASE, as the regional NOSC, assumed the role of responsible party for this Navy-related spill.

The exercise scenario used actual San Diego Bay tides for the day of the exercise; tidal conditions are summarized in table 1. The spill occurred at low water, so oil was transported further into the Bay for the first 6 hours of the event. Winds were very light and not much of a factor.

This 2-day exercise consisted of two separate phases: a command and control exercise on the first day, and an equipment deployment test on the second day.

Figure 1. Exercise scenario

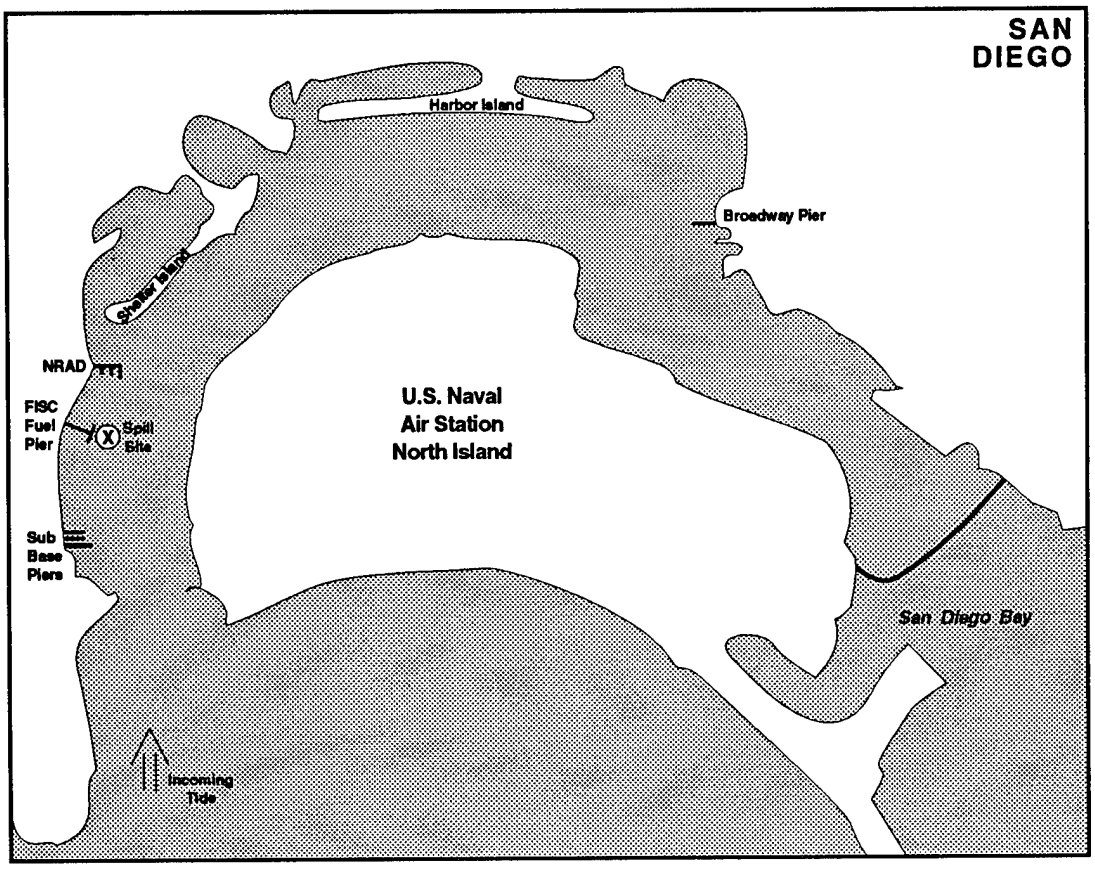


Table 1. San Diego Bay (Point Loma) tides for 27 September 1995

Low water	High water
0504	1115
1806	0012 (9/28)

The command and control portion of the exercise lasted about 10 hours. While players were directing the response to the spill described above, exercise controllers injected a series of scripted problems for players to deal with (i.e., angry boatowners, injured personnel, equipment casualties, etc.). These scripted problems were designed to exercise all elements of the response organization. The

command and control phase of the exercise (day 1) ended with the preparation of an IAP by the players.

The second day of the exercise was dedicated to the actual deployment of equipment. The goal for this phase was to execute the booming strategy called for in the IAP. This exercise did not test the timeliness with which these assets could be brought on scene. Equipment from various sources, including both private response cooperatives and the Navy Supervisor of Salvage, was brought on scene and readied several days before the start of the exercise.

Response organization

During the months leading up to this PREP area exercise, extensive spill response training was held for all participants. A 3-day Incident Command System (ICS) course was taught by the USCG and the California Office of Oil Spill Prevention and Response (OSPR), and a half-day "practice event" was held in which participants manned the positions they would play in the PREP exercise.

The PREP exercise command post was set up at COMNAVBASE headquarters, about 4 miles from the site of the incident. Predesignated spaces for each cell were equipped with phones and all necessary supplies, and were toured by all players prior to the exercise.

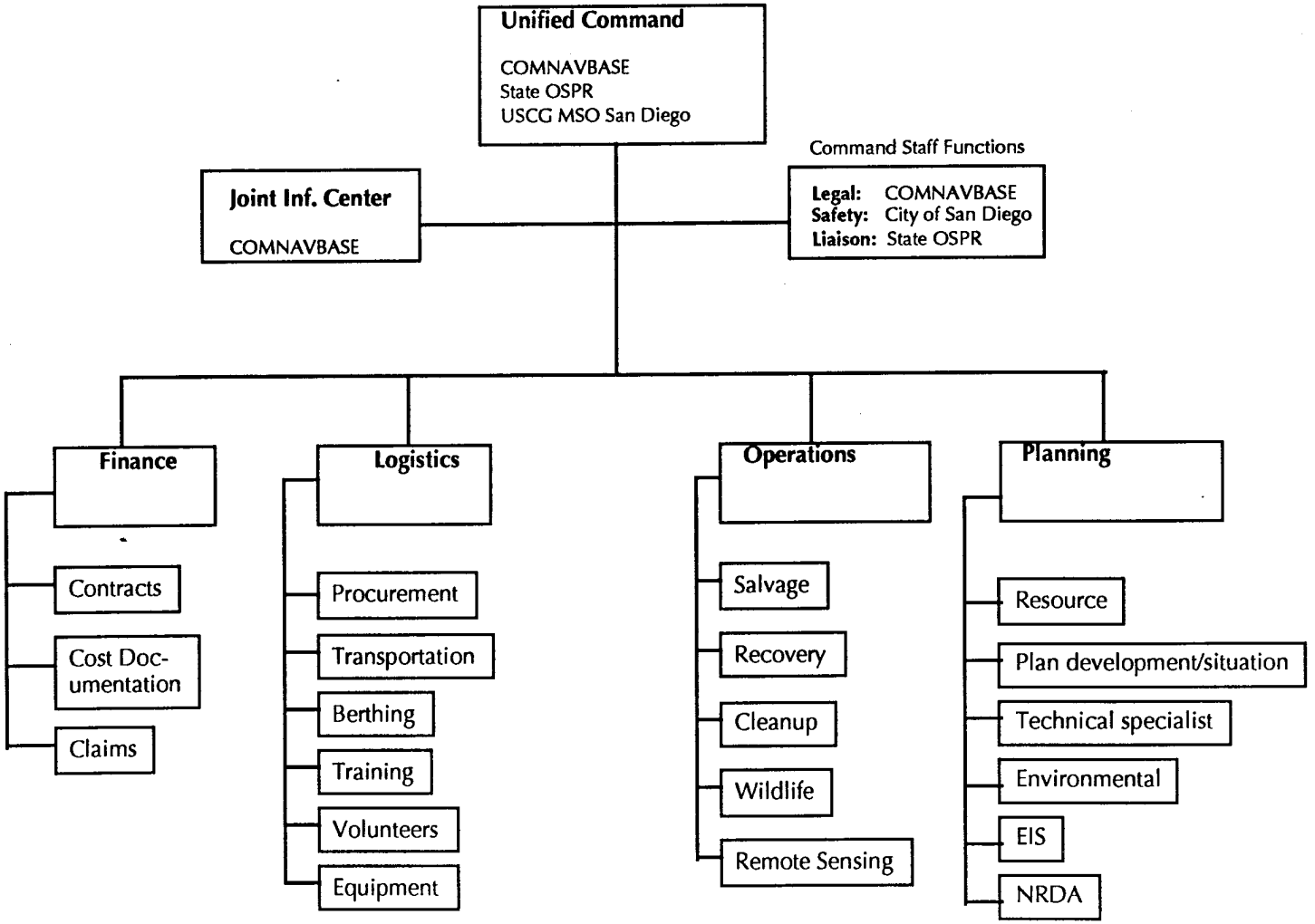
Figure 2 shows the basic command structure specified in the San Diego ACP [4]. The Unified Command consists of COMNAVBASE (as the responsible party), the state OSPR, and the local USCG MSO. The Commanding Officer of the USCG MSO, as the Federally Designated On Scene Coordinator (FOSC), holds ultimate authority over the spill response.

Narrative of key events

The exercise began at 0500,[1] with USS *Ogden* (LPD-5), playing the part of the USNS *Tippecanoe* (T-AO 199), tied up at the FISC fuel pier after filling with fuel the previous evening. At 0500, an exercise

1. All times in this report are local.

Figure 2. Response command structure



controller handed the master of the vessel (the actual master of *Tippecanoe*) an envelope initiating the exercise. He was told that a foreign vessel outbound from San Diego Bay lost steerage and drifted into *Tippecanoe*. No personnel were injured; however, a strong smell of fuel was present, and a major breach of one or more fuel tanks was suspected. The vessel master immediately ordered all tanks sounded. Two minutes later, he was told that the first mate threw a line overboard, and it came up soaked with DFM. At this time, the tide was just beginning to flood and winds were calm.

At this point (0502), the master initiated the notification process, instructing his first mate to make necessary notifications via FLTSEVOCOM, and at 0508, the master made a telephone report to the USCG National Response Center (NRC). While he was on the phone with the NRC, exercise control informed him that soundings indicated that his number 9 tank was down 150,000 gallons. He notified the USCG MSO, San Diego, at 0516, and instructed the ship to send out an OPREP message immediately. Due to an actual equipment casualty on the ship, this message was not sent. He was unable to reach the San Diego MSC office via telephone; he did reach MSC headquarters, Pacific.

At 0519, FISC initiated its notification procedures, and by 0600 it had recalled its Oil Spill Response Team (ORT) and notified, by telephone, the NOSC, MSO San Diego, NRC, California Department of Fish and Game, and the state Office of Emergency Services (OES).

The COMNAVBASE Chief of Staff (COS) was informed of the spill by the COMNAVBASE Duty Officer at 0520. The COS immediately assumed duties as the Incident Commander, activated the COMNAVBASE Emergency Operations Center (EOC), and called the NRC and the MSO. An Incident Command (IC) structure began forming at COMNAVBASE headquarters at this time. At 0540, the newly formed Operations Cell of the IC initiated immediate recall of the Naval Station and the Naval Air Station, North Island (NASNI) ORTs, and by 0555, COMNAVBASE was forming a Public Affairs Team for the situation. As USCG, state, and local agencies gathered at COMNAVBASE headquarters, a Unified Command began taking shape.

While a command structure was forming at COMNAVBASE headquarters, immediate response at the pier proceeded. By 0519, FISC personnel were out in small boats installing boom around the ship. (It was determined that there was no danger of fire or explosion.) This operation was completed by 0553. At this time, FISC personnel called the submarine base (SUBASE) requesting help with booming, and were told SUBASE had 2,000 feet of boom available. FISC and SUBASE agreed that protection of the marine mammals at SUBASE and at the Naval Research and Development (NRAD) facility was the immediate priority.

At 0530, exercise controllers updated the situation to the ship master:

- Only one cargo tank is ruptured.
- At least 200,000 gallons have been lost thus far.
- The break is below the water line.
- No personnel are injured.

Exercise controllers updated the situation again at 0630:

- 265,000 gallons have been lost.
- The tank is still leaking.
- Only one tank is ruptured.

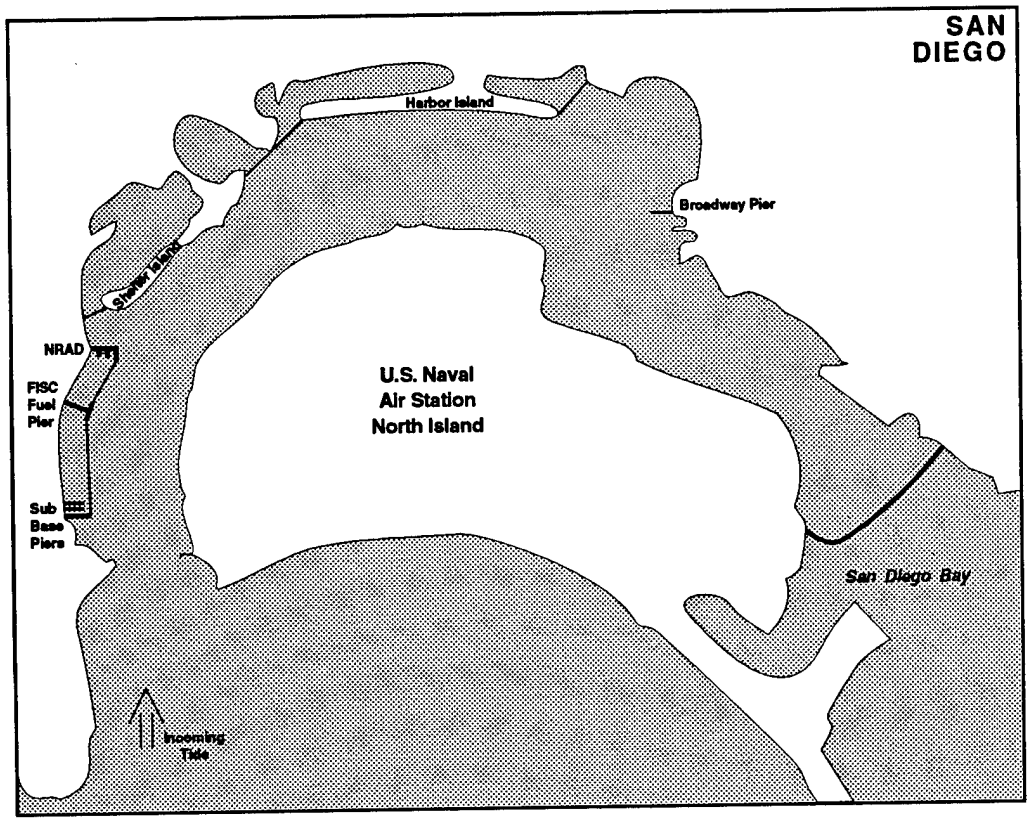
At this time, the ship began lightering.

Two USCG officers (one spill response specialist, one investigator) arrived on the FISC fuel pier at 0640, and were immediately briefed by FISC personnel. They then ordered in the Naval Station San Diego ORT, extra boom from NASNI, and booming of mammal pens and the entire area from SUBASE to the Scripps Pier at NRAD. At 0700, they informed FISC that the federal cleanup fund was opened, that FOSS Environmental Services (a local oil spill contractor) was ordered to boom Shelter and Harbor Islands, and that the USCG Strike Team was en route.

Figure 3 summarizes immediate response booming. Seven boom strings are shown. The strings protecting the marinas on Harbor

Island were installed by assets from NASNI, and were completed at 0735. The strings protecting the Shelter Island marinas were installed by FOSS. The boom from the NRAD pier to the north end of the FISC fuel pier was installed by the Naval Station ORT, and was completed by 0815. Boom around the ship was installed by FISC personnel by 0553, and the boom from the south end of the fuel pier to the SUBASE was installed by SUBASE personnel and completed at 0710.

Figure 3. Immediate response booming



At 0644, the U/C dispatched a mobile command post to the scene. It arrived on the pier at 0730 and was promptly set up, but it was never used.

For roughly the first 3 hours of the response, the ICS structure continued to form, while the emergency response continued at the scene. A Logistics Cell began forming at 0615, and it immediately began identifying additional resources. The Logistics Cell began receiving requests for equipment from the Operations Cell around 0720, and at 0750 Logistics defined an equipment staging area on Shelter Island.

A Liaison Officer was on scene in the ICS spaces by 0630—an obvious exercise artificiality because this was a state person who, in a real event, would be coming from Sacramento. The Liaison Officer was joined by legal and safety officers at 0700. The Safety Cell began work on a site safety plan almost immediately. An industrial hygienist, from the City of San Diego, arrived on scene at 0800.

The Public Affairs Cell had its first press release ready by 0712, and the U/C gave the O.K. to release it at 0750. By this time, the incoming tide had spread the slick almost to the northeast end of Shelter Island.

All three members of the U/C were present in the U/C spaces by 0755. Within 5 minutes, they had discussed dispersant use with the National Oceanic and Atmospheric Administration (NOAA) Scientific Support Coordinator (SSC), and rejected this option. By about 0800, it became obvious to the U/C that this was to be a long-term clean up effort, and they instructed their Planning Cell to begin planning accordingly.

SUPSALV in Stockton, California, was contacted by the Logistics Cell at 0904. Logs from the Logistics Cell indicate that SUPSALV was able to get some assets (including ten Marco Class-V skimmers) en route quickly, and promised additional assets within about 77 hours. (These ten skimmers represented Stockton's entire inventory of skimmers). Clean Coastal Waters (CCW), a California based oil spill cooperative, was also contacted, and it promised four vessels by that evening.

The U/C held its first section head meeting at 0900, by which time the slick had traveled up San Diego Bay as far as Broadway pier, with the oil primarily confined to the left side of the channel (looking up-Bay). The U/C decided that its main priority was to keep the oil

out of south Bay, i.e., not to allow it past the Coronado Bridge. As more assets were procured, booming operations just west of the bridge were initiated.

At 1000, the U/C issued its list of strategic objectives:

- Make all necessary notifications
- Ensure safety of all personnel
- Control the discharge
- Protect sensitive areas
- Recover oil effectively.

Under directions from the Operations Cell, the Logistics Cell continued to order in additional response assets. Because of problems accessing Navy spill response funds at the outset, the Finance Cell worked with the state (OSPR) and USCG funds until 1115, at which time contact was made with CINCPACFLT.

At 1115, the Planning Cell issued a list of sensitive areas to be protected beyond those identified in the ACP. These were:

- South San Diego Bay
- Eel grass area inside Point Loma
- Marriott marina
- Fishing Village marina.

Shortly after this, the response gradually began to move out of the chaotic crisis mode and into the controlled operation mode. A planning meeting was held at 1130, and following this, the Logistics Cell began reviewing disposal procedures, the city began preparing in the event any residential areas had to be evacuated, and the Logistics Cell made initial calls to arrange for messing and berthing for the many response personnel expected the following day.

The discharge was controlled at 1300, by lightering the vessel to raise the hole above the waterline. At 1630 an IAP was signed by the three

members of the U/C, bringing this phase of the exercise to a conclusion.

Table 2 summarizes the time line of major events.

Table 2. Summary time line of major events

Time (local)	Event
0500	Spill occurs
0508	NRC called by vessel master
0515	Sounding reveals 150K gallons spilled
0520	COMNAVBASE duty officer notified
0530	Sounding reveals 200K gallons spilled
0553	Booming of ship completed
0630	Sounding reveals 265K gallons spilled; begin lightering
0640	USCG arrives on scene
0700	Federal cleanup fund opened
0735	Harbor and Shelter Islands boomed off
0750	First press release
0755	All three members of U/C now at COMNAVBASE EOC
0900	First section head meeting
0904	Navy SUPSALV (Stockton) contacted
1000	U/C issues list of strategic objectives
1115	Planning Cell issues list of protection priorities
1300	Discharge stopped
1630	IAP signed by U/C; exercise ends

Results

In this chapter, we will present results in terms of cells of the response organization. It will allow players in this exercise, as well as players in future exercises, to focus on particular response cells.

In the final section of this chapter, we discuss the day-2 equipment deployment.

Unified command

Organization

The U/C consisted of representatives of the responsible party, the FOSC, and the state. These roles were filled by the Chief of Staff at COMNAVBASE San Diego, the USCG Captain of the Port of San Diego, and a senior officer of the California OSPR, respectively.

The U/C was located in the COMNAVBASE Emergency Operations Center (EOC). All players felt that the EOC provided suitable spaces for this cell.

Initial command actions

Elements of the U/C began forming at 0520, when the COMNAVBASE COS was informed of the spill by the COMNAVBASE duty officer. He immediately assumed duties as "Incident Commander," and formed and activated the COMNAVBASE emergency operations center. At 0600, he ordered a U/C formed. The FOSC was informed of the spill at 0530, and began gathering information before reporting to COMNAVBASE headquarters. By 0755, all three members of the U/C were present in the COMNAVBASE EOC.

All members of the U/C and their staffs (and, in fact, all members of the entire ICS) seemed to understand their roles and responsibilities

immediately upon reporting and were able to quickly organize and get down to work. Keep in mind, however, that conclusions concerning mobilization must acknowledge the exercise artificiality of all major players being at work early on game day and waiting for the exercise to begin. As one would expect in an exercise, several responded before they were even notified, and several state personnel from Sacramento were on scene artificially early.

The U/C Cell employed the principle of "command by negation." Two specific early response actions were directed by the U/C: deciding the issue of dispersants, and ordering the protection of the Harbor and Shelter Island marinas. Otherwise, the primary task addressed by the U/C Cell was to organize the ICS structure, generally leaving their cell leaders (Operations, Plans, Logistics, and Finance) to fight the spill. Most agreed that this was as it should be.

For example, at 0900 the U/C held its first organizational meeting with its cell leaders, at which the U/C asked these leaders to provide organizational charts for each of their cells. At this meeting, the U/C members were almost entirely in the receive mode with respect to specifics concerning field response. They did not issue any goals or objectives until the exercise was well along.

At 1000, the U/C did issue its list of overall response objectives:

- Make all necessary notifications
- Ensure safety of all personnel
- Control the discharge
- Protect sensitive areas
- Recover oil effectively.

By this time, the various cells were already well on their way to working toward these objectives, so the utility of the U/C taking the time to issue this list is questionable. In looking through logs from the various cells, there is no indication that this list had any effect on ongoing operations. Because these were so generic as to be of little use, this appeared to be an exercise in role playing, i.e., filling in the paperwork suggested in training.

Information flow

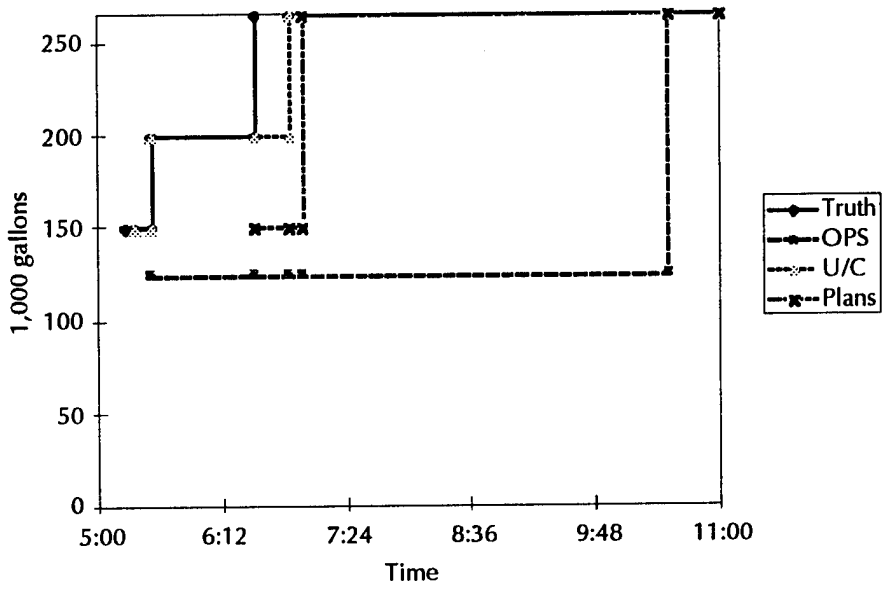
Flow of information throughout the response organization has been an ever present problem noted in previous PREP exercises. This exercise proved to be no exception. Each individual cell functioned smoothly, but very often important information needed by a particular cell was held somewhere else in the response organization but was unknown to those needing it. Information did flow freely among the various agencies comprising the Incident Command; the problem was flow of information among the cells.

COMNAVBASE hoped to avoid this problem by installing a computer-based emergency command and control system known as the Emergency Information System (EIS). This system, when working, will allow the U/C to instantly receive and display information, including graphics, to and from all cells. The system, still in its early stages of development, did not perform as hoped.

Figure 4 illustrates the problems the U/C had in disseminating critical information. It shows the volume of oil spilled, as a function of time, as seen from four views: the true volume, based on controller updates provided to the vessel master at the scene; the volume assumed in the U/C Cell; the volume assumed in the Operations Cell; and the volume assumed in the Planning Cell. In a perfect organization, this critical information, on which presumably almost all decisions would be based, should flow immediately from the vessel to the U/C cell, then out to all other cells.

The flow of this information from the vessel to the U/C went reasonably well, but the flow from the U/C to the Operations Cell did not go as well. During a critical 4-hour period early in the response, Operations thought it was dealing with a 125,000-gallon spill when in fact U/C knew the volume was 265,000 gallons. During this time, the Operations Cell was deciding what assets were needed, directing equipment procurements at 0735 and 0845.

Figure 4. Volume spilled, as seen from four views



Documentation

Documentation by the U/C was not adequate. The U/C cell did not designate any record keeper, so no watch log was generated. (They decided at the time that too many pieces of information were flowing in from various sources, and no one person would be able to keep up.) During the planning process for this exercise, it was hoped that the EIS computer system would serve as a mechanism of documentation; when EIS failed, no other arrangements were made. During post-exercise debriefs all members of this cell agreed that they should have designated a person or persons for this task.

Command staff

Organization

The Command Staff (C/S), which covers the functions of Legal, Safety, and Liaison, was located in the COMNAVBASE EOC in a room adjoining the U/C spaces. All players felt that this space was sufficient for this cell.

The primary positions on the command staff were filled as follows:

- Legal officer: responsible party representative
- Safety officer: San Diego Fire Chief
- Liaison officer: state OSPR representative
- Medical officer: City of San Diego public health official.

The legal, safety, and medical officers were on scene in the C/S spaces in the EOC by 0700, and at 0716 the liaison officer arrived. The early arrival of the liaison officer was an exercise artificiality because, in a real event, this person would be arriving from Sacramento. The exercise scenario as planned called for all out-of-town personnel to not be permitted on scene until 0930, as a hedge against the fact that most all players arrived in town for the exercise the night before. It appears that this wasn't enforced.

One legal specialist from COMNAVBASE was the entire Legal Section until two lawyers from OSPR arrived in the late morning. The Legal Section was rarely used by the U/C in this exercise.

Initial actions

The immediate task of the command staff was to develop a site safety plan, as ordered by the U/C at 0708. Their first concern in this regard was to determine whether a breathing hazard existed at the site of the spill. This was settled at 0730, when the C/S was informed by exercise control that air quality monitoring at the site determined that there was no breathing hazard.

The C/S completed a fill-in-the-blank Site Safety Plan within the first 3 hours, addressing initial Material Safety Data Sheet items. It was developed jointly by Navy, USCG, state, county, and city representatives. In addition, the Safety Officer on the C/S instructed the Operations Cell to ensure that all field personnel had received proper oil spill safety training.

Information management

The C/S wanted to ensure that safety issues were effectively communicated to the local emergency officials and to the public. In post-exercise debriefs, it was noted that this liaison function went quite well, with all agencies working together to allow timely assessment and dissemination of information concerning public health and safety issues.

Although information flow to the public went very well, the C/S experienced the same problems with information flow to the other cells as did the U/C. At the outset, the C/S tried to communicate with other cells using the EIS. When the EIS was abandoned, about 2 hours into the response, charts in the EOC were updated manually at regular intervals by a person assigned to this task.

Liaison, legal, safety, and medical were very parochial in working on their concerns in C/S. Simple things like answering phones, providing information to the Public Affairs Cell, and taking notes were ignored. All expected these things to be taken care of by some administrative support person, who didn't exist. Thus, logs were not kept.

Public affairs

Public Affairs was a strong point of this spill response.

This cell was primarily staffed by members of the COMNAVBASE public affairs office, and the cell occupied the actual COMNAVBASE public affairs office. Because this space is an actual public affairs office, the infrastructure, including telephones, computers, FAX, photocopiers, and other requisite equipment was sufficient for the task at hand.

The media first became aware of the spill from the first press release issued by Public Affairs at 0750. The first press briefing of the exercise was held at 0900 in the COMNAVBASE press room. At this time, the Public Affairs Cell was careful to ensure that it had the latest, most accurate information. This information was approved by the U/C Cell prior to release, but, interestingly, it still contained a factual error. This release and several that followed said that *Tippecanoe* was

taking on fuel at the FISC pier when it was struck by the other ship. In fact, it had taken on fuel the previous evening, and was just sitting at the pier when the accident occurred.

The Public Affairs Cell held media briefs at 0900, 1030, and 1330. The cell was prepared to hold hourly media briefs, but exercise constraints precluded more frequent briefs. Exercise control actually drove the briefing schedule.

All members of the Public Affairs Cell verified that the information they released was the most current available. They gathered their information from the U/C, other cells, and contacts with the field, and cleared all information with the U/C prior to releasing it. It was not observed that information was released to the public by parties other than the Public Affairs Cell.

EIS

The Emergency Information System (EIS) is a commercially developed computer-based command and control network designed for sharing of information between cells of an ICS-like organization. The version of EIS used in PREP was customized for the current task, with extensive graphics of San Diego Bay and a database of regional oil spill response assets.

Unfortunately, the system did not perform as was hoped; it experienced the typical array of hardware, software, and usability problems. Specific problems noted include:

- The EIS could not be brought on-line during the initial stage of the response. Once the system was on-line and running, EIS operators were too far behind the response organization, and they had been cut out of the information loop.
- The system was exceptionally slow in disseminating information about the incident.
- Operators could not follow standard operating procedures regarding their responsibilities for inputting data. Information

was eventually passed between sections using runners or phones, and the information was not given to the EIS operator.

- Operators were not sufficiently familiar with the system to troubleshoot their own problems.
- Various cells deviated from the previously agreed upon procedures without informing other section operators, which caused duplication of inputs (most notably with regard to graphics).

Some of these problems were probably training related. The operators for this exercise did not have adequate preparation time. The program was installed one month before the exercise, and only one training session with operators at their terminals could be held.

Keep in mind that this is a system in the early stages of development. Despite the problems, the consensus of exercise participants was that this system is clearly the way of the future—particularly in light of the information flow problems seen in this and nearly all previous PREP exercises.

Specific suggestions noted by players include:

- EIS would operate more efficiently on 486 DX2 systems or faster— ideally a Pentium 60 or 75 MHz processor with at least 12 MB of RAM should be used.
- There should be at least two EIS terminals in the EOC, Operations, Planning, and Logistics. The Finance and Public Affairs Cells need only one each. This would allow one operator to concentrate on communication between sections and printing of necessary reports. The other operator would perform data entry, and all other tasks required of the EIS operator.
- Training on EIS should include operators and cell leaders, or other appropriate users of the system. This training should be continued with regular practice sessions and mini-exercises so that key personnel will have realistic expectations of the capabilities of the program.

- Operators should not use the EIS/Infobook portion of the system because it slows the operator's ability to switch between data sets. Operators should work from the Manager Menu.
- At least 20 operators should be trained in the EIS program. This would allow two shifts of operators for long-term response operations.

The San Diego FOSC (the USCG COTP) urged continued development of this system, and will recommend, through the USCG chain, that it be used in future PREP exercises.

Operations

Organization

The Operations Cell was located in a large, divided room which was shared with the Planning Cell. Spaces were very adequate for players although they became crowded during visits by observers. The co-location of the Operations and Planning Cells was particularly good because it provided separate work space for each cell, but allowed quick and easy communications and sharing of information between cells. No status boards were maintained in Operations; the most recent spill "picture" was maintained on a chart in the Operations Cell. It presented a good, current depiction of operations. However, when too many people were present, some personnel did not have access to the information.

The leader of the Operations Cell was away attending briefings for roughly a third of the exercise period. Players and evaluators agreed that designation of a Deputy Operations Chief was very beneficial. The deputy remained in the cell and kept things moving during the cell leader's absence.

Excessive manning was noted as a problem in Operations. In the first few hours of the response, many people arrived who were not given specific assignments. This situation lasted throughout the day.

Information management

By 0658, the spill volume had almost doubled, and the increased estimate was not passed to the Operations Cell. By 0705, the Operations Cell realized that the U/C Cell was passing data via the EIS, and they were not getting the latest spill information. The Operations Cell sent a runner to the EOC to gather the most current information, but there is no indication that the Operations Cell received updated information on the total volume spilled. Similarly, the U/C felt that it was not receiving sufficient information from the Operations Cell.

The Operations Cell relied exclusively on overflights (simulated) to provide situational update. In post-exercise debriefs, it was noted that they could have used skimmers or other waterfront assets to update spill location and conditions.

Planning

The Planning Cell shared a large, divided room with the Operations Cell. Cell space for the Planning Cell was satisfactory, and all players agreed that this arrangement was beneficial to both cells.

Major actions

The immediate task performed by the Planning Cell was to coordinate a Natural Resources Damage Assessment (NRDA), which began at 0712. To accomplish this task, the Planning Cell decided to pool Navy, state OSPR, and U.S. Fish and Wildlife Service (USFWS) resources to conduct sampling to develop background baseline data. Coordination between agencies went very well on this task. This one-day exercise did not allow the NRDA to be played out further, i.e., the exercise ended before data could be collected and an actual report could be drafted.

The Planning Cell also provided periodic updates on tidal conditions and expected spill trajectories through the NOAA SSC. These products were updated at roughly 30- to 45-minute intervals, beginning around 0800. Early in the response, the Planning Cell consulted the ACP and identified all ecologically and economically sensitive areas requiring protection. In addition, they identified the following areas

not in the ACP, which were judged to be important to protect in the scenario at hand:

- South San Diego Bay
- Eel grass area inside Point Loma
- Marriott marina
- Fishing Village marina.

In addition to the above tasks, the main responsibility of the Planning Cell was to look ahead to day 2 (and on), and develop an Incident Action Plan (IAP) to help the response effort transition from crisis response to controlled operation. At 0800, the Operations Cell instructed the Planning Cell to begin planning for the next operational period.

Incident action plan

The IAP was first briefed by the Planning Cell to the U/C at 1500, and a revised version—which was subsequently signed—was briefed at 1630.

The most important element of the IAP was the booming strategy developed for day 2. Much of the other information contained in the IAP was administrative (organizational charts for the various cells, personnel lists, etc.). Some important information (discussion of exactly what additional assets will be required to execute the plan, precise reporting locations and assignments for reporting assets, etc.) was missing from the plan.

To some extent, the development of the IAP became an exercise in paperwork. It appeared that many players were too concerned with filling out standard ICS forms and doing just as they were taught in ICS training rather than thinking through the problem. When one player from the Planning Cell was asked by the U/C why some important piece of information was not included in the IAP, he replied that there was no form calling for that bit of information. Were it not for all the forms being used by members of the Planning Cell as they developed their plan, that information would probably have been included.

Miscellaneous issues

In the post-exercise debrief, the Planning Cell brought up several issues that are administrative in nature, but are still important lessons from the exercise.

Almost all players felt that locating the Planning and Operation Cells in the same large room greatly facilitated communications between these cells, which became particularly important when the EIS failed to work. However, they felt that crowd control was a major issue, and was something that should be considered in the event of a real emergency. Some of this excessive crowd was exercise artificiality (evaluators, observers), but much of it (too many players, late arriving personnel needing to be briefed on the situation) was not.

Status boards in the Planning and Operations Cells were not maintained satisfactorily. To further facilitate the flow of information between the Operations and Planning Cells, Planning Cell players recommend assigning liaison officers in each cell.

Members of the Planning Cell noted that the flow of information out of the U/C Cell was not adequate.

Logistics

The Logistics Cell occupied the COMNAVBASE Operations Office. By 0741, space problems became evident. Several people had to share a single desk, and phones became a "choke point" (3 phones for 12 people). Exacerbating the lack of adequate space was the fact that the Logistics Cell was separated from the Operations and Planning Cells. A better arrangement would have been a location closer to the Operations and Planning Cells, each with large, separate spaces located adjacent to each other for ease of communication and sharing of status boards. (Had EIS been fully functional, the status board issue would have been minimized.)

Coordination problems between the Operations and Logistics Cells were evident as early as 0715. Operations perceived it was getting too many questions from Logistics and that Logistics was giving no feedback on the status of assets requested. Communications improved as

the exercise progressed. Much of this miscommunication could have been avoided had Operations placed a liaison in Logistics to help interpret the requests for assets.

The Logistics Section Leader was well prepared in managing the cell; however, like many of the personnel manning Logistics, he had little experience with oil spills. Illustrative of the lack of experience in the cell was an occasion where, when booming assets were requested, Logistics ordered a zodiac with a 15 hp motor, manned by Navy SEALS, to pull class II boom. (This arrangement was far too small for this task.) The lack of experience could have been minimized by having Operations position a liaison in Logistics with both spill response experience and local knowledge of responders (as noted above). The Worst Case Discharge section of the NOSC Plan, and the ACP, both contained a great deal of resource information, but they were not utilized to identify those assets. However, both the NOSC plan and the ACP were used to obtain needed phone numbers.

By 1019, Logistics Cell personnel began to realize they were not maintaining complete records of requests for assets, i.e., time ordered, exactly what was ordered, when will it arrive, etc. Equally important, they were not keeping careful track of expenses. Later in the response (1254), they overspent the USCG oil spill fund. (This error was realized and corrected within a few minutes.) However, had Logistics personnel kept a running total of obligated funds, they could have avoided the issue of ordering resources in excess of authorized funding.

Finance

The Finance Cell was located in the COMNAVBASE Operations Officer's office. Players reported that these spaces were inadequate. They noted a lack of desk space and telephones. Because the Finance Cell occupied the COMNAVBASE Operations Officer's office, in a real spill with a multiday response, this cell would likely have had to move to another location.

For the most part, this function went well during PREP. Flow of information from the Logistics Cell to the Finance Cell was adequate, and

the Finance Cell was able to track expenditures. Several calls for claims, from private citizens and businesses, were received by the Finance Cell. The Finance Cell responded to these by taking the necessary information and informing the caller that the claim would be referred to the appropriate Navy legal offices in Washington D.C.

Equipment deployment (day 2)

The command and control/ICS portion of PREP concluded with the development of the IAP on the afternoon of 27 September. Day 2 of PREP was dedicated to actual equipment deployment on the water; other than a handful of players in the U/C and Operations Cells, who were present to test communications with the field, no players in the ICS structure were involved.

The goals of this phase of PREP were:

- To the extent possible, "...demonstrate the ability to assemble and deploy the on water resources identified in the Incident Action Plan...", as mandated by PREP guidelines [1]
- Test communications between the response command center at COMNAVBASE and assets in the field
- Provide training for field response personnel.

With respect to the first goal, it was recognized at the outset that actually deploying all of the assets called for in responding to a major spill would be far too expensive an undertaking for an exercise. Therefore, deployment of only a small sample was required.

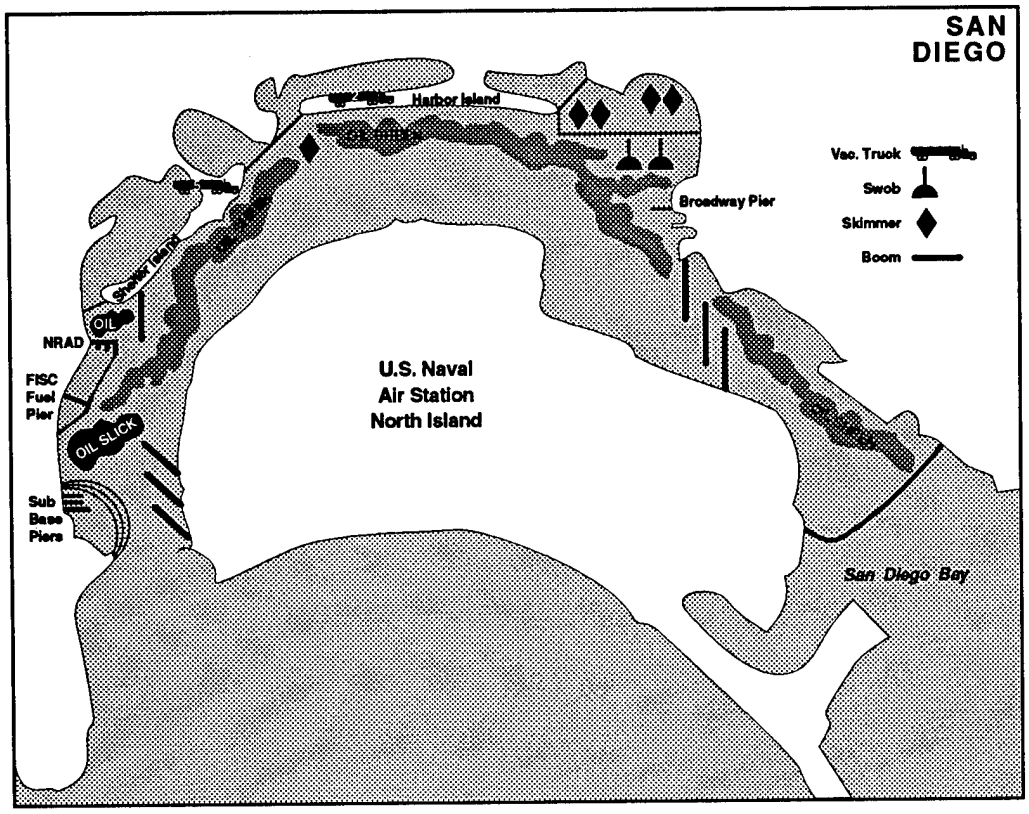
Response equipment

Figure 5 shows the total equipment deployment planned by the end of the period covered by the IAP. It includes the first day's booming (little of which was actually done), plus the planned day 2 deployments.

Vessels, boom, and other assets from the Navy, USCG, and private contractors and spill cooperatives were staged throughout the bay during the equipment deployment drill. Several skimmers and the

USCG's Open Water Containment and Recovery System (OWCR) operated, and several boom strings were actually deployed.

Figure 5. Equipment deployed through the period covered by the IAP



This deployment served as a very useful training and communication exercise; it did not demonstrate an ability to obtain and deploy the resources identified in the IAP, for two reasons:

- Only a small fraction of the equipment called for in the IAP was actually deployed on day 2.
- Almost all of this gear was prestaged in San Diego in anticipation of PREP, so we cannot draw any conclusions regarding the ability to obtain and mobilize assets in a timely manner.

Communications

Field operations were divided into five geographic sectors, with each sector assigned a specific radio frequency for communications with the command post. The communication plan specified in the IAP called for a radio communicator in the COMNAVBASE EOC to be able to talk to each of the five sector supervisors.

When first attempted, this communications plan did not work. Apparently, the frequencies specified in the IAP did not match the previously published PREP radio frequencies which had been preprogrammed into the EOC radios. When this occurred, EOC communicators estimated 40 to 45 minutes to reprogram radios to correct the problem.

In the interim, a simple workaround was quickly established. The COMNAVBASE EOC was able to communicate with the SUPSALV command trailer located on Broadway pier, who acted as a relay for information between the COMNAVBASE EOC and the five field supervisors. The initial frequency mismatch was corrected within 27 minutes, and communications as originally planned worked smoothly.

To some extent, the minor communications problem discussed above was an exercise artificiality—and to some extent it was real. Had this event not been planned for, frequencies would not have been preassigned, and all players would have simply referred to the frequencies specified in the IAP. However, in anticipation of a potential real event in the future, COMNAVBASE should decide whether it will work out a standard communications (frequency) plan which all personnel will use when they arrive on scene, or whether they will wait for this to be worked out in an actual IAP. Either system will work—but it should be decided and noted in the NOSC plan to avoid any delays in the event of an actual emergency.

Lessons learned in terms of the standard PREP evaluation objectives

Here we present lessons learned and conclusions in terms of the 15 PREP standard evaluation objectives [1], which summarize the basic tasks that make up an oil spill response. These 15 components fall into three categories:

- Command organization
- Response operations
- Support.

Command organization

Notifications

Notifications went well in the exercise. All personnel at the vessel and FISC were able to quickly perform all required notifications, and COMNAVBASE also notified the NRC and MSO in a timely manner. However, records of what agencies were notified were not kept, either at response headquarters at COMNAVBASE or at the USCG MSO.

It was noted in post-exercise debriefs that the San Diego Port Authority was not included in early notifications. Our search of the ACP did not uncover a listing for this agency, or other important San Diego City agencies. Responsibility for notifying local agencies rests with the state OES; future revisions of the ACP should specify this more clearly. It was also suggested that future revisions of the ACP include in the notifications sections the telephone numbers of major marinas in the area.

One important note: At least one of the phone numbers listed for OSPR in the ACP needs to be updated. Our evaluation didn't go to

the level of checking telephone numbers—we assume it to be a given that all emergency telephone numbers are always checked and updated in all revisions of the ACP.

Mobilization

For the most part, mobilization was not tested in this exercise. Because this was not a no-notice drill, most players were in place much more quickly than would be the case in an actual event. In fact, players from at least two agencies were on the scene before they had been notified.

One aspect of the mobilization process was realistically played, however: the ability to quickly organize those that are present into a working organization. About a month before the PREP, a half-day "practice" exercise was held in conjunction with ICS training. Thus, almost all of the players involved in PREP knew their assignments in advance, and, upon arriving, were able to immediately get down to work. This isn't an exercise artificiality: Should this spill happen for real tomorrow, these players would know exactly what their roles are.

This is a clear example of the training value obtained from an exercise such as this. Of course, rapid turnover of personnel is a fact of life in the military and Coast Guard, so this well trained force will be largely gone after about two years, as we will discuss in the next chapter.

Ability to operate within the UCS

All agencies involved at response headquarters fit together and knew their roles well. Upon assuming duties, all cells in the response organization consulted the appropriate plans (primarily the ACP) and executed accordingly.

However, too many personnel were assigned to the response headquarters staff. Perhaps this is an exercise artificiality—in a real event, many of them wouldn't have shown up so soon. Whether real or not, it is important that the Unified Command bring in only as many personnel as are needed to do the job. Although all agencies want to help in the event of a real emergency, they may not all be needed—at least

not at the outset. This is an important issue which should be looked at in future PREP exercises.

A crucial aspect of any command system is information flow. In the command system exercised in PREP, flow of information between cells was clearly a problem. The Operations Cell often didn't know what the Logistics Cell had ordered, and Logistics usually didn't know what type of equipment the Operations Cell needed. Critical information, such as the volume of oil spilled, did not flow readily between the U/C Cell and all other cells.

To some extent, the players comprising the command system were too concerned with forms and paperwork at the expense of critical, tactical, thinking. Examples include the U/C Cell issuing a list of strategic objectives of marginal utility, and the Planning Cell submitting an IAP containing a lot of unnecessary information (which, however, was called for on the standard ICS forms given to the players during training) and lacking some needed information. Future San Diego ICS training should place more emphasis on spill response tactics and fighting the spill at hand, as opposed to organizational and paperwork protocol.

This organizational structure did not support the timely acquisition of response equipment. The communication difficulties between the Operations Cell, which initially decides what equipment is needed, and the Logistics Cell, which goes out and orders it, produced a situation whereby Operations would have been better served ordering the equipment themselves. Future PREP exercises should explore the relationship and division of tasks between the Operations Cell and the Logistics Cell.

Response operations

This category of response functions deals primarily with the actual on-water activities—controlling the discharge, recovering the oil from the water, etc. Of course, an exercise without any actual spill allows us to examine these issues only marginally.

Discharge control

Discharge control was not exercised during PREP. Exercise controllers simply declared the discharge to be under control some time in the mid afternoon, when they decided that enough oil had been spilled for the purpose of this exercise.

Assessments

The Area Plan states that a helicopter should fly over the crisis area to assist in the initial assessment. The responsibility for periodic assessments rests mainly with the Planning Cell.

Assessments were not realistically exercised in PREP. An actual overflight for the initial assessment did not occur. (It was decided during exercise planning that, in the interest of cost savings, no actual flight would be used.) Rather, exercise control simulated this by telling the FOSC what he "saw" when he went up in a helicopter.

The simulated assessments appeared to have minimal impact, and point to the ever present problems with information flow. The Planning Cell passed the results of the simulated overflight to the Operations Cell at 0816, but there is no indication that the Operations Cell received this information or did anything with it. Logs from the Operations Cell note receiving the pilot report from the first overflight at 1130.

We didn't see any examples of other assets (i.e., boats) being dispatched to assess field conditions.

Containment, recovery, disposal

Containment was one of the highest priorities of the response organization. Within 19 minutes of the spill, FISC personnel were at work placing boom around the ship, and completed this task 55 minutes after the time of the spill. During subsequent response operations, several areas of pooled oil were contained with boom to allow recovery with skimmer or vacuum truck (figure 5). The overall booming strategy employed was very consistent with the priorities given in the ACP.

The boom around the spilling vessel was actually deployed by FISC personnel; the other containment booming referred to above was merely an exercise construct. Therefore, we cannot come to any conclusions concerning the ability of the response organization to actually contain any oil, or even deploy the necessary resources for this task.

During the equipment deployment phase on day-2, several skimmers and other recovery vessels, as well as several vacuum tucks, were actually deployed throughout the Bay. No oil was actually recovered or disposed of during PREP. Due to the volatility of DFM, and its tendency to disperse throughout the water column, the best time for recovering this product from the water is as soon as possible after it is spilled (table 3). Therefore, recovery success is highly dependent on the ability to get recovery equipment in action as soon as possible.

Table 3. Evaporation/dispersal budget

Hours after spill	Percent evaporated	Percent dispersed	Percent floating
0	0	0	100
3	10	0	90
6	19	1	80
9	25	2	73
12	30	3	67
24	41	9	50
36	47	15	38
48	51	20	29

Disposal was considered and planned for early in the response. At 1020, the three U/C members discussed precleaning of beaches and potential arrangements for the ultimate disposal of recovered oil. There is no indication that any calculations of the expected volume of oil/oily water/oily waste were made by anyone in the response organization.

Protection

Protection of human health, natural resources, and property was the focus of the entire response and, of course, is the major challenge. San Diego Bay contains several major marinas, each filled with valuable vessels. The kelp beds and heavily used ocean beaches just outside the Bay are extremely valuable natural and recreational resources. Therefore, in the event of a spill such as the one played in PREP, the response organization is in the position of having to prevent, for all practical purposes, any oil from reaching land anywhere.

The response organization in this exercise was able to address the protection priorities set forth in the ACP. The ACP was consulted early and often, and all areas identified in the plan were taken into account. The NOAA SSC was able to provide various prediction products that allowed the response to keep one step ahead of changing tidal and wind conditions. One lesson was noted in this regard: To help ensure protection of private property, the ACP should include phone numbers of local marinas.

Use of dispersants, burning, and bioremediation were considered early and dismissed. It seems unlikely that these options will be used in the event of a spill of light fuel in San Diego Bay.

Public health concerns were well considered, and the inclusion of city health and emergency services personnel was considered a major help in this regard. An important lesson learned in this exercise was the importance of bringing worker health and safety officials on scene as early as possible, because field operations can be (and almost were) completely shut down until it is determined that worker safety conditions are satisfied.

Support

Communications

In large, complex command structures, information flow is almost always the Achilles heel. In years of analyzing Navy battle group exercises, we almost always find that when an incorrect tactical decision is

made, the information which would have led to a different decision is held somewhere in the battle group but is unknown to the decision-maker. This PREP area exercise was no exception. The flow of information between cells in the organization did not go as smoothly as it could have. Interestingly, several controllers and observers involved in this exercise said that compared to most other PREP exercises, information flow here was typical, if not good.

Part of this problem was due to the failure of the EIS, but part of it could have been avoided through command attention. Members of the U/C should be certain they understand what information major decisions being made in the various cells are based upon.

Some of the internal problems with information flow seen in this exercise might also be due to the size and level of compartmentation of the response organization. Information would probably flow more easily throughout a leaner organization. Future PREP exercises should examine the pros and cons of smaller command organizations.

Transportation

All out-of-town personnel and equipment were staged to San Diego before the start of the exercise, so we cannot evaluate the ability of this response organization to transport assets quickly.

Personnel support

Personnel support functions include coordinating assignments for incoming personnel, providing for messing and berthing, providing adequate administrative spaces, and properly addressing site safety issues.

Coordination of assignments in command headquarters went very smoothly because of the extensive training conducted prior to PREP, as discussed previously under "Mobilization." It is unlikely that an actual spill would follow closely on the heels of an extensive training and organizational session, so the ease in organizing seen in this exercise probably represents the best possible performance in this regard.

Messing and berthing were not really played in this exercise (although COMNAVBASE was able to easily provide lunches for all players during the command and control phase). Because San Diego is a major city and contains several very large military installations, these functions should not be a major problem.

Spaces in command headquarters were very adequate, for the most part (the only exceptions were the Logistics and Finance Cells where desk space and phone lines were judged inadequate). The idea of locating the Planning and Operations Cells adjacent to one another (sharing a large, divided room) was very well received, as was locating the C/S adjacent to the U/C.

During PREP, the response command center occupied several offices and administrative spaces regularly used at COMNAVBASE headquarters. In an actual spill that requires a long-term response, COMNAVBASE would eventually need these spaces returned to normal duty and the response organization would have to move. The need to transition the response command center to another location was not played in the exercise.

Site safety was generally handled early and effectively. PREP provided a clear illustration for all players of the potential impacts if worker safety issues are not resolved.

Equipment maintenance

Because the PREP equipment deployment exercise was only a one-day event, we could not analyze the ability of the response organization to support and maintain equipment. However, those agencies that did participate (especially Navy SUPSALV) are self-sufficient, bringing extensive support infrastructure to the scene. Furthermore, San Diego is not a remote location, so one would not expect equipment support and repairs to be a major problem.

Procurement

The primary source of the procurement problems that were noted was a lack of communication flow between the Operations and Logistics Cells. Early in the exercise, members of the Logistics Cell often

did not understand exactly what types of equipment the Operations Cell wanted them to order. Also, members of the Operations Cell did not know the status of their equipment requests because the Logistics Cell did not pass this information to any other cells upon making orders. These initial problems smoothed out as the exercise progressed. Many of these problems could be solved with the designation of a liaison officer between the Operations and Logistics Cells.

The responsible party (the Navy) had difficulty gaining access to Navy funds early in the exercise, and was unaware of the possibility of having the state OSPR fund opened. When state officials made the Navy aware of the available state fund, it was used until funding from the Navy could be obtained. Therefore, it is important that each agency that has access to oil spill cleanup funds be included in the Finance Cell to ensure that all available sources of funding are known.

Documentation

Documentation was clearly a weakness in this response organization. Most cells did not keep watch logs or communications logs. The level of documentation maintained did not allow an analysis of the information on which major decisions were based.

In a real event, the U/C cell must take much more responsibility for seeing that all cells maintain watch logs and that all major actions and decisions are documented.

Two issues related to PREP in general

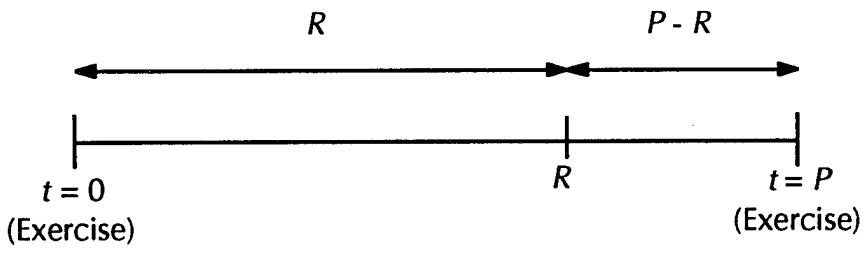
Issue 1: Triennial exercises and the Navy

The PREP program was designed with the oil producing and transporting industry in mind. Each area of the country performs a PREP exercise once every 3 years. That is probably often enough for the private sector where personnel tend to stay in their jobs for a long time, but how does this 3-year training cycle affect the Navy, which rotates its personnel roughly every 2 years?

Let's look at the following question: Given that a spill occurs at some random time, what is the expected fraction of San Diego Navy personnel that were around for the last PREP exercise?

Assume that PREP exercises are conducted every P years, and all Navy personnel are on an R-year rotation schedule, $R < P$. (This does not imply that all Navy personnel rotate at the same time; it states that they all serve 2-year tours, but their arrival/departure times are randomly staggered (uniformly distributed) over time.) Referring to the time line in figure 6, PREP exercises are conducted at times $t = 0$ and $t = P$. The time indicated by $t = R$ is the time beyond which no personnel will remain from the first PREP exercise.

Figure 6. Triennial exercise time line



The probability that an actual spill occurs when some trained personnel still remain (i.e., between $t = 0$ and $t = R$) is given by R/P. The probability of a spill occurring when none are present (i.e., between $t = R$ and $t = P$) = $1 - (R/P)$.

Assuming that personnel rotate in and out uniformly over time, the fraction (X) of personnel who were present for the first PREP, as a function of time, from $t = 0$ to $t = R$ is given by

$$X = (R - t)/R \ ,$$

which varies from 100 percent immediately after the PREP ($t = 0$) to none at $t = R$.

Assuming a spill is equally likely to occur at any time, the expected fraction ($E(X)$) of trained personnel present if a spill occurs between times $t = 0$ and $t = R$ is given by

$$E(X)_{t=0,\,t=R} = \int_0^R \frac{1}{R} \times \left[1 - \frac{t}{R}\right] dt = \frac{1}{2} \ .$$

Recall that the expected number between $t = R$ and $t = P$ is zero. Therefore, the overall expected fraction of trained personnel at any time is

$$E(X) = \frac{1}{2} \times \left[\frac{R}{P}\right] + 0 \times \left[1 - \left(\frac{R}{P}\right)\right] = R/(2P) \ .$$

For the case of exercises every 3 years and a Navy 2-year rotation cycle, we can expect that only one-third of the Navy personnel present will have been through a PREP exercise. Of course, some personnel stay in billets longer than 2 years, and personnel often rotate from billet to billet within the San Diego area. And, many of the Navy responders were civilian employees. Overall, however, the results of the above analysis are probably close to what could actually be expected for military personnel.

This represents a far lower level of training than we had in the exercise, where virtually all personnel were thoroughly trained prior to PREP. This suggests that this PREP exercise showed the best possible performance.

Perhaps one-third is a sufficient core of trained personnel to lead a response; at this point, there is no way to tell. However, this example does point out a fundamental issue which should be considered when applying a periodic training program to the Navy.

Issue 2: What can this exercise tell us?

In this section, we will discuss what can and cannot be learned from an exercise such as this one. We'll do this by taking a slightly analytical approach, and breaking a successful response down to its basic components. Hopefully, this discussion will help us better interpret our results and conclusions, and point out aspects of our response duties that must be tested some other way.

What are the PREP evaluation goals?

In general, all exercises, be they fleet battle group exercises or this PREP, serve two main purposes: training, and development or refinement of tactics. In the case of PREP, these take the following forms:

- *Training*: improve the response capability of the agencies comprising the San Diego area committee through practice for those who would respond to an actual spill.
- *Tactical development*: test the area plan to see what works and what doesn't.

The first item listed above, training, is fairly straightforward to understand and to achieve with an exercise. The second item, which covers testing of plans, is more complicated and much harder to achieve. Let's look at it in some detail.

PREP guidance states that these exercises are designed to "...examine the response plan and the plan holder's ability to coordinate with the response community to conduct an effective response to a pollution incident" [1, pg 2-1]. This suggests that our goal as we evaluate this exercise should be to address the "bottom line" questions: How ready to fight a major spill is this community? How likely is this community to be successful if there was a spill tomorrow?

What is a successful oil spill response?

What is a successful response to an oil spill? It isn't making notifications, forming a Unified Command, or communicating effectively. These are just support functions. A successful response is preventing injury to people and the environment, minimizing property damage, and doing so as quickly and economically as possible.

Success depends on two conditions: We need a good "game plan," and we must be able to execute it. We can have a perfect plan, but if we can't execute it properly, we might not achieve success. Similarly, we can do exactly what the plan says, but if the plan is flawed, we might not achieve success.

What does PREP allow us to assess?

To execute the plan, the response community must perform, among other things, the following main functions:

- *Mobilize*: Get people and response equipment on scene quickly.
- *Communicate*: Both within the command and to field units
- *Support the operation*: Keep both people and equipment on the scene and functioning for an extended period of time.

This exercise might allow us to draw some conclusions concerning our ability to execute the area plan, but even these conclusions must be interpreted cautiously. The most important function in executing the plan is mobilization: getting people and equipment on the scene quickly, and PREP doesn't play this aspect very well. A no-notice drill would test mobilization much more realistically.

The key outcomes that define a successful response, given that the plan was executed, are primarily:

- *Protection*: Protect human health, property, and the environment, as stated in the NCP.
- *Containment*: The oil must be kept out of sensitive areas, and not allowed to disperse so as to make recovery impossible.

- *Recovery*: The oil must be picked up (keeping in mind that, historically, about a 10- to 15-percent recovery is considered good).

With no actual oil in the water, we can't assess how well these operations are working. Therefore, this exercise does not really allow us to conclude very much about our probability of success given that we execute the plan.

This is not to say we can't learn valuable lessons from this type of exercise. We can, and we did. We gained valuable insights into areas in which further training is required, and discovered many aspects of the plan that could be changed, or at least made more clear. We've learned many lessons that will help us better execute our response plans. The exercise also provided a great deal of much-needed training for all agencies involved.

However, as we evaluate this exercise and interpret results, we must be careful not to try to extrapolate exercise results to expected success in combating a real spill. Just as the military makes very clear about its use of wargames: These games (exercises) allow us to train, learn, and refine tactics, but they do not allow us to predict outcomes of future real-life wars.

Appendix A: Participating agencies

U.S. Navy

- ASW Training Center, San Diego (Security Div)
- Asst. Secretary of the Navy (Installations and Environment)
- Center for Naval Analyses (CNA)
- Chief of Naval Operations (N45)
- Commander Fleet Activities, Sasebo, Japan (Port Services Div)
- Commander Helicopter Tactical Wing Pacific
- Commander in Chief Pacific Fleet (CINCPACFLT) (Comptroller, Environmental)
- Commander Naval Air Forces, Pacific (COMNAVAIRPAC) (Environmental)
- Commander Naval Base, Jacksonville (Environmental)
- Commander Naval Base, Pearl Harbor (Environmental)
- Commander Naval Base, San Diego (COMNAVBASE)
- Commander Naval Base San Francisco (Environmental)
- Commander Naval Base Seattle (Environmental, Staff)
- Commander Naval Forces Japan (Environmental, Public Works)
- Commander Naval Surface Force, Pacific (COMNAVSURFPAC) (Environmental)
- Commander Submarine Force, Pacific (COMSUBPAC)
- Commander Submarine Group Two (Environmental)

- Commander Third Fleet (Environmental)
- Fleet and Industrial Supply Center, San Diego (FISC) (Fuel Dept., Comptroller, Facilities, Environment)
- Fleet Imaging Command Pacific
- Helicopter Combat Squadron Eleven (HS-11)
- Military Sealift Command (MSC) (HQ Washington DC, San Diego, Pacific)
- Naval Air Facility El Centro (Environmental)
- Naval Air Station Lemoore (Emergency Management)
- Naval Air Station Miramar (Hazardous Waste, Security)
- Naval Air Station North Island (Emergency Management, Oil Spill Response Team)
- Naval Amphibious Base Coronado (Emergency Management)
- Naval Command, Control and Ocean Surveillance Center, RDT&E Division, San Diego
- Naval Facility Engineering Command (NAVFACENGCOM) (West, South, SW, Service Center)
- Naval Medical Center San Diego (Emergency Room, Security)
- Naval Reserve Readiness Command (NAVRESREDCOM) Region 19 (PAO, Environmental)
- Naval Sea Systems Command (NAVSEA) (Environmental Programs)
- Naval Shipyard Long Beach (Federal Fire Department)
- Naval Station San Diego (Emerg Mgmt, Environmental, Port Services/Oil Spill Response Team, Transit Personnel Unit)
- Naval Telecommunications Station Command San Diego (Data Procurement)
- Naval Training Center San Diego (NTC) (Environmental)
- Naval Undersea Warfare Center, Keyport

- Navy Legal Services Office San Diego
- Navy Petroleum Office (NAVPETOFF)
- Navy Supervisor of Salvage
- NCBC Port Hueneme (Emergency Management, Waterfront Operations)
- NCCOSC San Diego (Marine Environmental Sciences)
- NCTCS San Diego
- Personnel Support Activity San Diego
- Personnel Support Detachment (Balboa, Coronado, Naval Medical Center San Diego, Naval Training Center)
- Public Works Center San Diego (PWC) (Communications, Transportation)
- Submarine Base, San Diego (SUBASE) (Emergency Management, Security, Waterfront Operations)
- U.S. Marine Corps Base Camp Pendleton (Environmental)
- U.S. Naval Reserve PAO 1924
- U.S. Naval Reserve VTU 1911G
- U.S. Navy Supervisor of Salvage (SUPSALV)
- USNR VTU, San Diego
- USNS *Sioux* (TATF) (ship/crew)
- USS *Kitty Hawk* (CV-63) (PAO)
- USS *Ogden* (LPD-5) (ship/crew)
- USS *Tarawa* (Combat Cargo Officer)

U.S. Coast Guard

- 11th Coast Guard District
- Air Station San Diego

- Marine Safety Office Los Angeles-Long Beach (MSO)
- Marine Safety Office San Diego (MSO)
- Marine Safety Office San Francisco (MSO)
- National Strike Force Coordination Center (NSFCC)
- Pacific Strike Team
- USCG Reserve Unit (Salt Lake City, UT) NSFES

California State/County/City

- California Department of Fish and Game
- California Office of Oil Spill Prevention and Response (OSPR)
- City of San Diego, Office of Emergency Management
- County of San Diego, Department of Environmental Health Services
- County of San Diego, Office of Disaster Preparedness
- San Diego Bay Pilots Association
- San Diego City Lifeguards
- San Diego Fire Department (Hazardous Materials)
- San Diego Fire Department, Federal (Hazardous Waste, Training)
- San Diego Gas & Electric
- San Diego Harbor Police
- San Diego Harbor Tug and Barge
- San Diego Ports, Marine Operations Department
- State Lands Commission
- State Office of Emergency Services
- Unified Port District, Port of San Diego

Other agencies

- ACTI
- ANCON Marine Services
- ARCO Marine
- Advanced Cleanup Technology
- Bay Keeper Association
- Clean Coastal Waters (CCW)
- Department of Interior, U.S. Fish and Wildlife Service
- Emergency Information Systems International (EIS)
- Federal Fire Department
- Foss Environmental Services
- GPC
- Geocon Environmental Consultants, Inc.
- Hart Crowser Earth and Environmental Technology
- Jankovich and Son, Inc.
- National Oceanic and Atmospheric Administration
- National Park Service
- Newport Petroleum
- Outbound Harbor Pilots Association
- PCCI
- Port Operations Pascagoula, MS
- Precision Environmental Resources Land/Air/Sea
- Sea World San Diego
- Solano Beach Marine Safety
- Thomas Hill and Associates Consulting Engineers

- U.S. Department of the Interior (Environmental Affairs)
- U.S. EPA Region 9 (Tech Assist Team)
- U.S. Fish and Wildlife Service
- YYK Enterprises

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